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Euphydryas anicia and *E. chalcedona* in Idaho (Lepidoptera: Nymphalidae)[1]

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Abstract. The nymphalid species *Euphydryas anicia* and *E. chalcedona* are sympatric in several areas in Idaho and easily separated from one another by features of the male genitalia and differences in forewing maculation. While *anicia* and *chalcedona* are closely related, distinct differences can be identified, thus substantiating their separation as two species.

Introduction

The taxa *Euphydryas anicia* (Doubleday) and *E. chalcedona* (Doubleday) have been considered historically to represent separate species, and they have been so treated in the two most recent lists of the North American butterflies (Miller & Brown, 1981; Hodges *et al.*, 1983), as well as in two recent papers (Brussard *et al.*, 1985; Spomer & Reiser, 1985). Based upon his analysis of the male genitalia of these insects, Scott (1978[80]) considered these two taxa conspecific. My field studies in Idaho indicate that *E. anicia* and *chalcedona* occur sympatrically at several localities, and that they may be separated on the basis of characters in the male genitalia and dorsal wing maculation.

Following the findings of Brussard *et al.* (1985), the generic name *Euphydryas* is used in this paper rather than *Occidryas* Higgins.

Study Areas

Fig. 1 is a map showing the distributions of *Euphydryas anicia* and *E. chalcedona* in Idaho. The records are based on my own collecting and data provided by Stanford (1985). Both species occur widely in Idaho, but to date they have been found to be truly sympatric in two localities only. The first site is in Boundary Co. and lies east of Hwy. 95 and northwest of Moyie Springs in the Kaniksu National Forest. Both *E. anicia* and *E. chalcedona* were collected on July 6–7, 1985 flying together in a small open meadow near a railroad right-of-way.

The second site is in the Bear Valley region of Valley Co. in the

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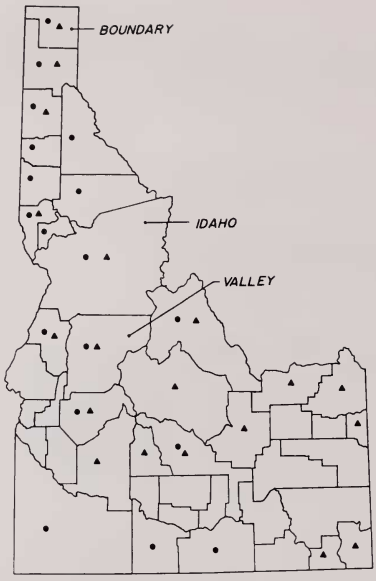

Fig. 1 Idaho map showing distribution by county of *E. anicia* (triangles) and *E. chalcedona* (solid circles).

vicinity of the Deer Creek crossing of the Boise National Forest road that connects Warm Lake with Hwy. 12. Specimens of the two species were taken together along the road and on an adjoining cleared forest slope on July 24, 1984. Elsewhere in Valley Co., *chalcedona* occurs in the Payette National Forest just north of McCall, and *anicia* is found in the general vicinity of Warm Lake and Stolle Meadow.

Study Material

During this study, 283 Idaho specimens (106 *anicia*, 175 *chalcedona*, 2 equivocal) were examined.

Wing Maculation

Euphydryas chalcedona throughout its range in Idaho is relatively constant in facies. Adults are dorsally predominately black with red-and-white maculation; ventrally the ground color is brick red. The subspecific epithet usually applied is *wallacensis* Gunder (= *huellemanni* dos Passos). Two typical pairs are shown in Fig. 2.

Euphydryas anicia in Idaho is variable. In the broad sense, it can be divided into two color groups: 1. dorsal ground color generally black; 2. dorsal ground color red/orange. Both forms manifest pale white or cream-colored spots dorsally. The dark form displays red markings similar to those of *chalcedona*. The ventral ground color of Idaho *anicia* varies from brick red to red-orange. The VHW pale intercellular maculation varies in extent according to local colony. Because of the variability of *anicia* in Idaho, no subspecific epithets are applied in this paper.

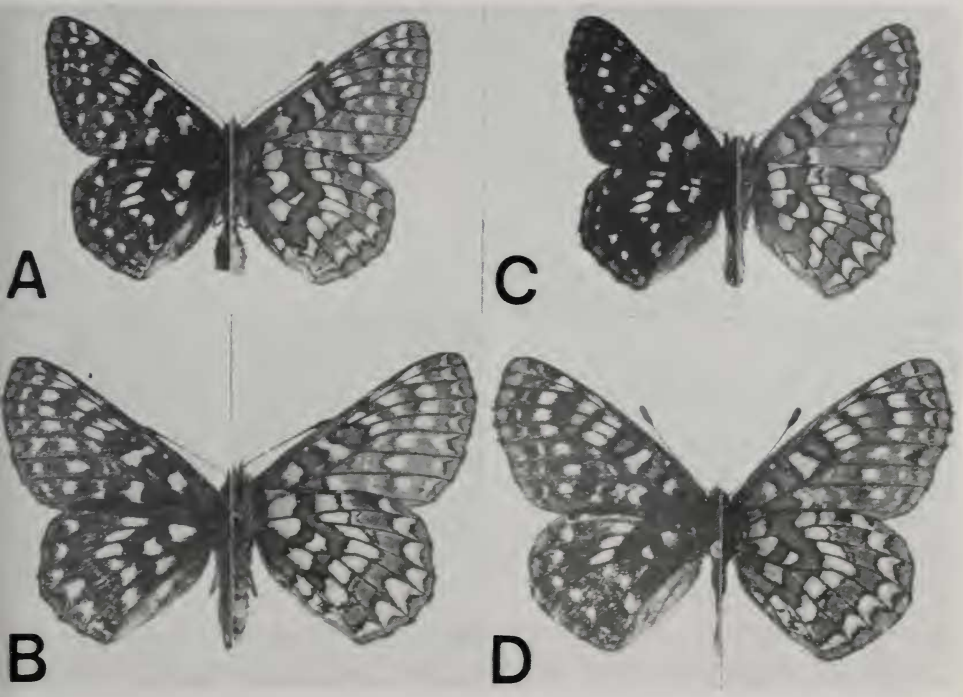

Fig. 2. *E. chalcedona wallacensis* from Idaho. Dorsal surfaces left; ventral right. A. Male. Payette Nat. For., 1 mi. N. McCall, Valley Co., 1.vii.83. B. Female. Same locality, 13.vii.84. C. Male. Canyon Creek, Idaho Co., 31.v.85. D. Female. Kaniksu Nat. For. NW Moyie Springs, Boundary Co., 7.vii.85. All C. D. Ferris Coll.

Specimens of *anicia* collected at the Boundary Co. site are brightly colored and belong to the red/orange category. Two color forms of *anicia* occur in Valley Co.: 1. a red form similar to the Boundary Co. phenotype, but not so brightly colored; 2. specimens that generally fall into the black category, but variable.

Some of the dark *anicia* specimens appear in maculation superficially similar to *chalcedona*. These two species can be separated, however, on the basis of the form of the marginal spot-band on the DFW, as illustrated in Fig. 3. In both sexes of *anicia*, the DFW marginal spots form a complete border along the outer edge of the wing. In *chalcedona wallacensis*, the spot-row normally terminates about vein Cu_1 in the males, and although it frequently extends to vein 2A in the females, the spots are much reduced in size below vein Cu_1. This spot-row in *anicia* is clearly double at the apex of the FW, while in *chalcedona* immediately basad of the marginal red spot-row, there is a blackish band distad of a row of small whitish spots. The apical double spot-row in *anicia* may present concolorous spots, or the inner row may contain whitish spots. Ventrally, especially on the HW, *chalcedona* generally

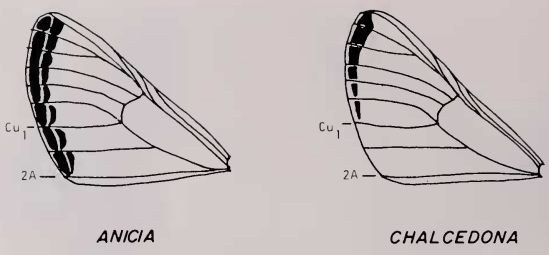

Fig. 3. DFW marginal spot-band maculation in Idaho *E. anicia* and *chalcedona*.

displays much more extensive brick-red coloration than is found in *anicia*, but this character is not relaible. Fig. 4 depicts specimens of *E. anicia* from the Boundary Co. (A-B) and Valley Co. (C-D) populations. Fig. 5 illustrates a pair of the dark phenotype from Stolle Meadow in Valley Co.

Genitalic Studies

Fig. 6 depicts the diagnostic portions of the male genitalia of *E. anicia* and *E. chalcedona* from Idaho. In this figure, drawings A and E represent typical *chalcedona*, while B-D and F represent typical *anicia* (G will be addressed subsequently). These illustrations show the distal portion of the right valve and its processes with the abdomen rotated 90° from normal life position. This is the view of the genitalia seen using a binocular dissection microscope after the abdominal hairs have been removed (by use of a stiff brush). It is not necessary to dissect the genitalia from the abdomen. To achieve the views shown in Fig. 6, it may be necessary to angle the specimen relative to the microscope objective.

As the illustrations show, *E. chalcedona* manifests one long and curved process, and a short pointed process (which may be slightly recurved). By contrast, *anicia* presents two long curved processes (frequently of nearly equal length) which various authors have likened to knitting needles. In my studies of males of *anicia* collected from Chihuahua, Mexico to the southern Yukon Territory, the valvular processes are remarkably consistent in form, and do not intergrade into the form found in *chalcedona*. The two species, however, may hybridize as discussed below.

Intermediate Specimens

Of the Idaho material, only one pair of intermediate specimens has been found. They are illustrated in Fig. 7, with male genitalia in Fig. 6 (G). In dorsal maculation, both specimens are closer to *chalcedona* than *anicia*, although the form of the male genitalia is closer to *anicia*. This pair may represent a hybrid between the two species, but more likely it

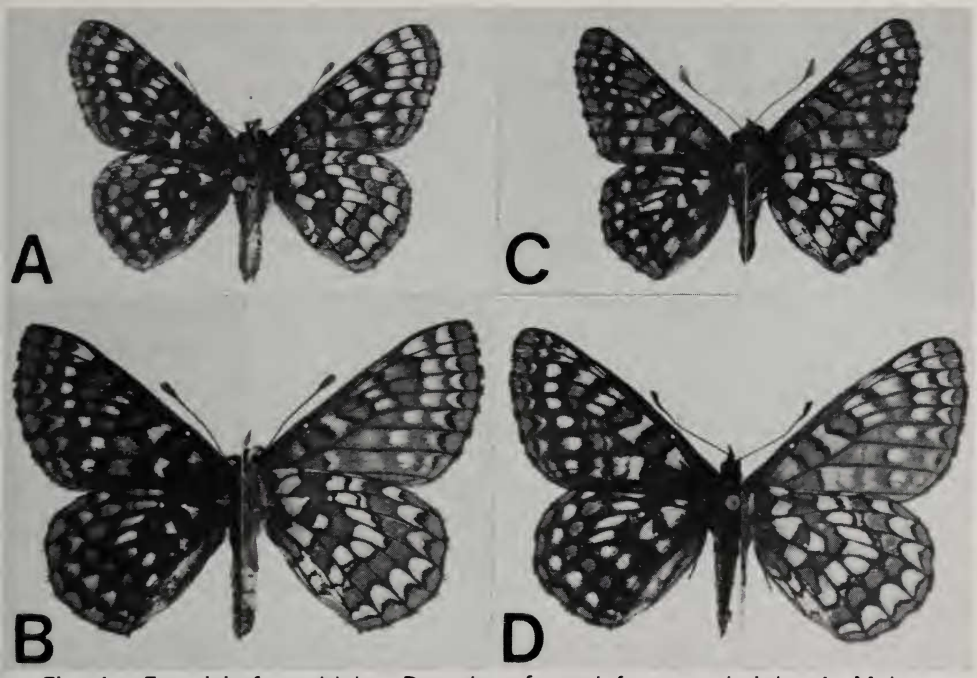

Fig. 4. *E. anicia* from Idaho. Dorsal surfaces left; ventral right. A. Male, red/orange form. Kaniksu Nat. For. NW Moyie Springs, Boundary Co., 6.vii.85. B. Female. Same data. C. Male, red/orange form. Deer Creek, Boise Nat. For., Valley Co., 24.vii.84. D. Female. Same data. All C. D. Ferris Coll.

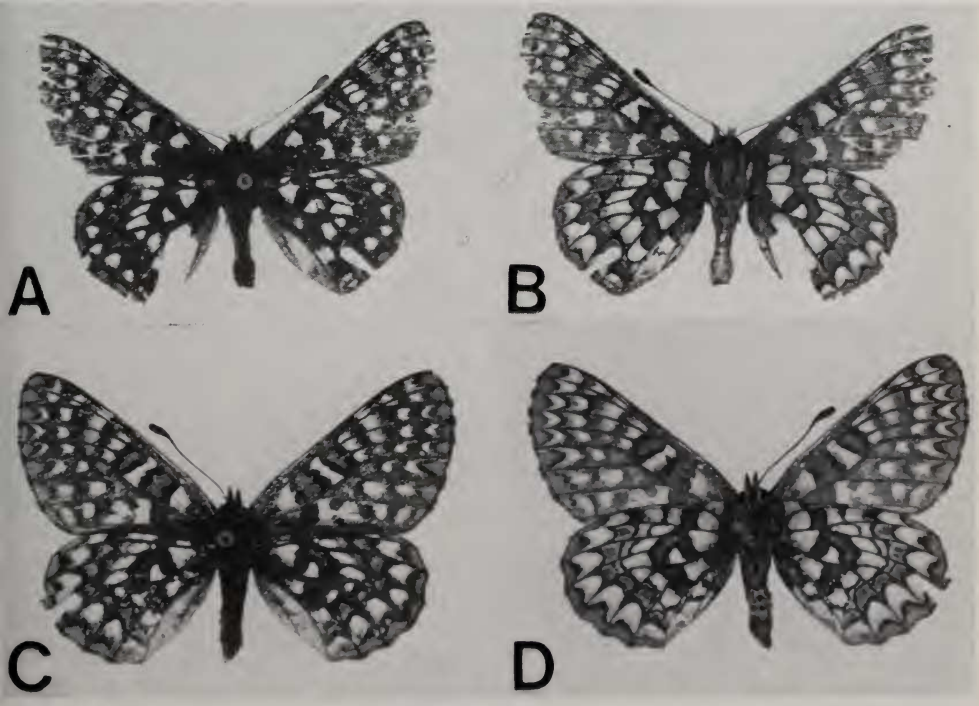

Fig. 5. *E. anicia* dark form from Stolle Meadow, Boise Nat. For., Valley Co., Idaho, 13–17.vii.83. A. Male, dorsal. B. Male, ventral. C. Female, dorsal. D. Female, ventral. All C. D. Ferris Coll.

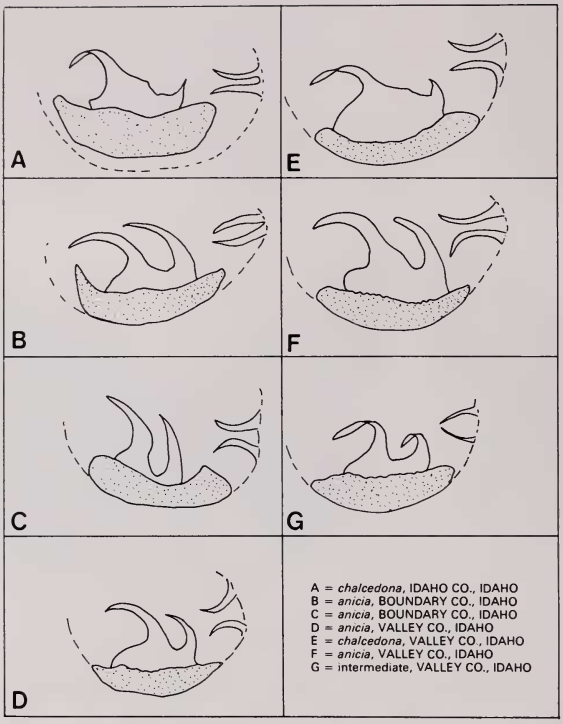

Fig. 6 Male genitalia (valvular processes) of Idaho *Euphydryas*. A, E. *E. chalcedona*. B–D, F. *E. anicia*. G. Equivocal specimen.

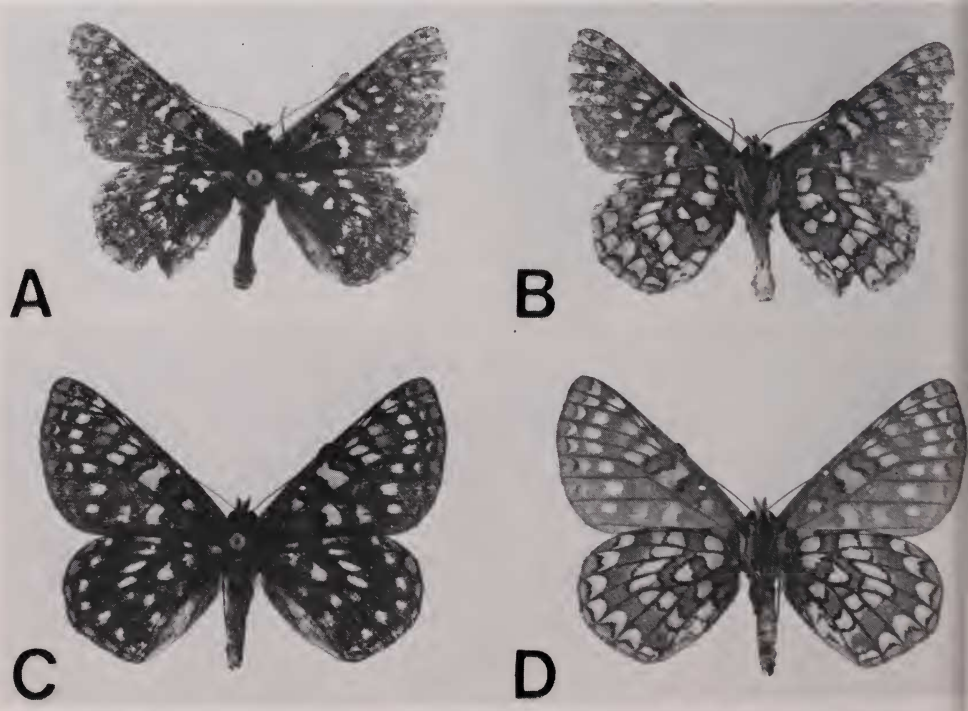

Fig. 7. Equivocal *Euphydryas* pair from Deer Creek, Boise Nat. For., Valley Co., Idaho, 24.vii.84. A. Male, dorsal. B. Male, ventral. C. Female, dorsal. D. Female, ventral. All C. D. Ferris Coll.

is an extreme variant of the *anicia* phenotype. Occasional dark individuals occur in many *anicia* populations, perhaps as a consequence of thermal shock during the prepupal stage.

Various authors have suggested that *paradoxa* McDunnough (usually referred to *chalcedona*) represents a stable hybrid between *chalcedona* and *anicia*. It is not the intent of this paper, however, to review species that occur outside of Idaho.

Conclusion

On the basis of my studies in Idaho and the data presented above, I conclude that the taxa *anicia* and *chalcedona* represent closely related but separate species. They can be distinguished by differences in the male genitalia and FW maculation. Their flight periods overlap, with *chalcedona* on the wing from mid-May into late July depending upon geographic location and elevation. *E. anicia* generally appears in early July and survives into August at suitable elevation.

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